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Statistical optimization of gelatin immobilisation on modified surface PCL microcarrier to improve PCL microcarrier compatibility (Article)

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Abstract

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Growing cells on microcarriers may have overcome the limitation of conventional cell culture system. However, the main challenge remains at ensuring the surface biocompatibility with cells. Polycaprolactone (PCL), a biodegradable polymer, has received considerable attention because of its excellent mechanical properties and degradation kinetics that suit various applications, but its non-polar hydrocarbon moiety renders it sub-optimal for cell attachment. In this present study, the aim was to improve biocompatibility of PCL microcarrier by introducing oxygen functional group via ultraviolet irradiation and ozone aeration (UV/O_3 system) to allow covalent immobilization of gelatin on the PCL microcarrier surface. Respond surface methodology was used as a statistical approach to optimized parameters that effect the immobilization of gelatin. The parameters used to maximized amount of gelatin immobilize were the mol ratio of COOH:EDAC, NHS concentration and gelatin concentration. The optimum conditions for maximum amount of gelatin (1797.33 µg/g) on the surface of PCL were as follows: 1.5 of COOH:EDAC ratio, 10 mM NHS concentration and, 80 mg/ml gelatin. The result shows that gelatin coated PCL microcarrier promote more and rapid cell adhesion with density of 16.5 $\times 10^5$ cells/ml as compared to raw PCL microcarrier (2.4×10^5cells/ml) and UV/O_3 treated PCL microcarrier (4.25×10^5cells/ml). Therefore, immobilization of gelatin with optimized parameters onto PCL microcarrier improved biocompatibility of PCL microcarrier.

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(2017) Cytotechnology

Surface modification of polycaprolactone membrane via heparin for osteogenic differentiation of MC3T3-E1 cells

Gümüsderelioğlu, M. , Karakeçili, A. , Demirtaş, T.
(2011) 24th European Conference on Biomaterials - Annual Conference of the European Society for Biomaterials

Preparation and cytocompatibility of Chitosan-modified polylactide

Xiao, Y. , Li, D. , Chen, X.
(2008) Journal of Applied Polymer Science

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References (17)

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1 Brun-Graeppi, A.K.A.S., Richard, C., Bessodes, M., Scherman, D., Merten, O.-W.
Cell microcarriers and microcapsules of stimuli-responsive polymers

(2011) *Journal of Controlled Release*, 149 (3), pp. 209-224. Cited 57 times.
doi: 10.1016/j.jconrel.2010.09.023

View at Publisher

2 Tan, H., Huang, D., Lao, L., Gao, C.
RGD modified PLGA/gelatin microspheres as microcarriers for chondrocyte delivery

(2009) *Journal of Biomedical Materials Research - Part B Applied Biomaterials*, 91 (1), pp. 228-238. Cited 37 times.
http://www3.interscience.wiley.com/cgi-bin/fulltext/122351887/PDFSTART
doi: 10.1002/jbm.b.31394

View at Publisher

3 Nikam, V.K., Gudsoorkar, V.R., Hiremath, S.N., Dolas, R.T., Kashid, V.A.
Microspheres - A Novel Drug Delivery System. International Journal of Pharmaceutical and
(2012) *Chemical Science*, 1, pp. 113-128.

4 Ma, Z., Gao, C., Ji, J., Shen, J.
Protein immobilization on the surface of poly-L-lactic acid films for improvement of cellular interactions

(2002) *European Polymer Journal*, 38 (11), pp. 2279-2284. Cited 81 times.
doi: 10.1016/S0014-3057(02)00119-2

View at Publisher

5 Yuan, S., Xiong, G., Roguin, A., Choong, C.
Immobilization of gelatin onto poly(Glycidyl Methacrylate)- grafted polycaprolactone substrates for improved cell-material interactions

(2012) *Biointerphases*, 7 (1-4), pp. 1-12. Cited 27 times.
http://scitation.aip.org/content/avs/journal/bip
doi: 10.1007/s13758-012-0030-1

View at Publisher

6 Khan, W., Kapoor, M., Kumar, N.
Covalent attachment of proteins to functionalized polypyrrole-coated metallic surfaces for improved biocompatibility

(2007) *Acta Biomaterialia*, 3 (4), pp. 541-549. Cited 64 times.
doi: 10.1016/j.actbio.2007.01.006

View at Publisher

7 Zhu, Y., Gao, C., Liu, X., Shen, J.
Surface modification of polycaprolactone membrane via aminolysis and biomacromolecule immobilization for promoting cytocompatibility of human endothelial cells

(2002) *Biomacromolecules*, 3 (6), pp. 1312-1319. Cited 295 times.
doi: 10.1021/bm020074y

View at Publisher

8 Mojarradi, H.
Coupling of Substances Containing a Primary Amine to Hyaluronan via Carbodiimide-mediated Amidation
(2011) *Uppsala University Publications*, pp. 1-44.

9 Wahid, Z., Nadir, N.
Improvement of one factor at a time through design of experiments

(2013) *World Applied Sciences Journal*, 21 (SPECIAL ISSUE1), pp. 56-61. Cited 13 times.
http://idosi.org/wasj/WASJ21%28mae%2913/10.pdf
doi: 10.5829/idosi.wasj.2013.21.mae.99919

View at Publisher

10 Hinkelmann, K., Kempthorne, O.
(2008) *Design of Experiment: Introduction to Experimental Design.*. Cited 2 times.
John Wiley and Sons, New York

11 Prockop, D.J., Udenfriend, S.
A specific method for the analysis of hydroxyproline in tissues and urine

(1960) *Analytical Biochemistry*, 1 (3), pp. 228-239. Cited 678 times.

View at Publisher

12 Hermanson, G.T.
(2008) *Bioconjugate Techniques. 2Nd Edd*. Cited 5 times.
San Diego: Academic Press

13 Gomathi, N., Neogi, S.
Surface modification of polypropylene using argon plasma: Statistical optimization of the process variables

(2009) *Applied Surface Science*, 255 (17), pp. 7590-7600. Cited 52 times.
doi: 10.1016/j.apsusc.2009.04.034

View at Publisher

14 Kemala, T., Budianto, E., Soegiyono, B.
Preparation and characterization of microspheres based on blend of poly(lactic acid) and poly(ε-caprolactone) with poly(vinyl alcohol) as emulsifier

(2012) *Arabian Journal of Chemistry*, 5 (1), pp. 103-108. Cited 27 times.
doi: 10.1016/j.arabjc.2010.08.003

View at Publisher

15 Goh, T.K.-P., Zhang, Z.-Y., Chen, A.K.-L., Reuveny, S., Choolani, M., Chan, J.K.Y., Oh, S.K.-W.
Microcarrier Culture for Efficient Expansion and Osteogenic Differentiation of Human Fetal Mesenchymal Stem Cells
(2013) *Bioresearch Open Access*, 2 (2), pp. 84-97. Cited 55 times.

16 Yang, Y., Porté, M.-C., Marmey, P., El Haj, A.J., Amédée, J., Baquey, C.

Covalent bonding of collagen on poly(L-lactic acid) by gamma irradiation

(2003) *Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms*, 207 (2), pp. 165-174. Cited 41 times.
doi: 10.1016/S0168-583X(03)00456-7

View at Publisher

17 Arifin, M.A., Mel, M., Samsudin, N., Hashim, Y.Z.H.-Y., Salleh, H.M., Sopyan, I., Nordin, N.

Ultraviolet/ozone treated polystyrene microcarriers for animal cell culture

(2016) *Journal of Chemical Technology and Biotechnology*, 91 (10), pp. 2607-2619. Cited 2 times.
http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1097-4660
doi: 10.1002/jctb.4855

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